P-10.5 Differentiate heat and temperature in terms of molecular motion.

Revised Taxonomy Level 4.1B Differentiate conceptual knowledge

Physical Science students did not address this topic.

It is essential for students to

- Understand that heat is thermal energy that is absorbed, given up, or transferred from on body to another, while temperature of a body is a measure of its ability to give up heat or absorb heat from another body.
  - Heat will flow from a body with a higher temperature to a body with a lower temperature, even if the cooler body contains more thermal energy.
- Understand that temperature is an indication of the average kinetic energy of the particles of a substance.
  - Because it is an indication of the average kinetic energy, a liter of boiling water and two liters of boiling water will have the same temperature
- Understand that internal energy is an indication of the total internal energy (potential and kinetic) of the particles of a substance
  - Because it is an indication of the total internal energy, there is twice as much thermal energy in two liters of boiling water as in one liter.
- Heat is measured in units of joules, temperature in degrees Celsius, degrees Fahrenheit, or Kelvin

Assessment

As the verb for this indicator is differentiate, the major focus of assessment should be for students to distinguish between the relevant and irrelevant parts or important from unimportant parts of presented materials. Because the verb is differentiate, rather than compare, students thoroughly understand the terms temperature and heat in terms of the kinetic theory. Because the indicator is written as conceptual knowledge, assessments should require that students understand the "interrelationships among the basic elements within a larger structure that enable them to function together." In this case, assessments must show that students understand how heat and temperature effect and are affected by the internal energy of a substance.